REMARKS

The present invention is directed to spunbonded nonwovens having a low density and isotropic tensile properties. The nonwoven has an increased concentration or proportion of filaments in the CD direction to enhance the isotropic properties. More particularly, the web is deposited onto the conveyor using a die that is inclined relative to longitudinal direction. In this manner, the number of die deposited filaments across the width of the nonwoven is increased and improved isotropic properties are achieved.

The nonwoven is defined in claims 10 and 12 by its physical properties including its density, MD/CD ratio and its MD and CD tensile indexes. The tensile indexes are strip tensile properties as described at page 7 of the application. The nonwoven is further defined in claims 11 and 13 by the increased number of filaments in the width direction.

Claim 10 recites an MD/CD ratio of less than 1.3, a density of less than 0.01 g/cm^3, an MD tensile of at least 1.5 N/50mm per gram of nonwoven, a CD tensile of at least 1.3 N/50mm per gram of nonwoven, and weight between 12 g/m^2 and 150 g/m^2. Claim 12 is similar to claim 10, but recites an MD/CD ratio of less than 1.1.

Claims 11 and 13 each recite that the number of filaments deposited by the die in the width direction is increased by an angular die orientation as compared with an identically formed nonwoven except that the die is not disposed at an angular orientation. The resulting nonwoven has an increased number of filaments in the width direction to enhance the isotropy of the MD-CD tensile properties as indicated by claimed ratio.

The low density and isotropic properties of the claimed nonwovens make them particularly useful as a covering layer for feminine hygiene products, as covering sheets for plants under cultivation in the agricultural field, as filter media for filtering air or gases or liquids, as coating substrates and as wiping products. The nonwovens provide a better rate of fluid acquisition and a higher rate of spread, which makes them particularly useful for diapers. The liquid diffusion displays a substantially circular pattern, which operates to increase the useful area for acquisition and absorption of liquid. These latter improvements are believed to be associated with the increased CD filament concentration and the maintenance of isotropic characteristics.

In filtration applications, larger instantaneous retentivities are found and only a single layer of the

nonwovens according to the invention is equivalent to filter media consisting of four layers according to the prior art. This is demonstrated in the application and discussed below.

The forgoing improvements and advantages of the claimed nonwovens are disclosed throughout the present application and particularly detailed at pages 2 and 6 of the specification.

It is requested that the Examiner reconsider and withdraw the rejection of claims 10 and 11 under 35 USC 102(e) as anticipated by or, in the alternative, under 35 USC 103(a) as obvious over US patent 7,091,140 to Ferencz et al. ("Ferencz"). As discussed below, Ferencz does not inherently disclose the claimed physical properties and nonwoven. Further, Ferencz provides no teachings as to the preparation of any specific nonwoven example and does not disclose the claimed increase in filaments in the CD direction.

In support of the claim rejection, certain of the data in Fig. 12 of Ferencz are cited and the remaining properties are alleged to be inherent based on the use of like materials. Therefore, the Examiner deems the burden to be shifted to applicants to prove otherwise. In response to this burden, applicants submit that Ferencz does not

comprise a like material since it does not teach the claimed increase in number of filaments in the CD direction. Ferencz actually corresponds with the prior art nonwovens obtained by non-angular orientation of the die.

The claimed angular die orientation results in an increased number of filaments in the CD direction and thereby provides a nonwoven structural feature not taught in Ferencz. This is illustrated in the specification with two dies disposed in opposite directions as shown in Fig. 2 of the drawings.

Applicants have discovered that the desired combination of physical properties is achieved through the enhanced concentration of filaments in the CD direction. Ferencz does not teach or suggest concentration of filaments in the CD direction. In the absence of such teachings, there is no expectation that Ferencz would achieve the claimed nonwovens having the recited combination of physical properties.

The benefits of applicants' discovery are particularly shown by the increased CD properties which in turn enable improved isotropy. This is readily shown by examination of the strip tensile properties reported in Fig. 12 of Ferencz.

For comparison purposes, the Ferencz strip tensile values are converted to the reported and claimed CD tensile index units of "newtons per 50 mm per gram of nonwoven" as follows. Initially, as noted in Ferencz at column 10, lines 6-14, for purposes of evaluating physical properties including grab tensile and strip tensile: "The test methods used and characteristics tested for are described generally in U.S. Pat. 3,485,706 to Evans, herein incorporated by reference."

Referring to Evans, the ASTM standards are referenced and the 0.5 inch wide strip tensile sample is identified. Therefore, the reported Lb/0.5 inch values are converted to N/50 mm per gram of nonwoven and the corresponding values are reported in the following table.

Ferencz Example Number	Reported CD Value Strip Tensile (Lb/0.5 inch)	Converted CD Index Value (N/50 mm per gram of nonwoven)
106	4	2.06
401A	2.9	1.49
103	6	1.54
402A	5.8	1.49
102	2.1	0.54
402C	2.4	0.61
302	4.4	0.77
403B	4.5	0.78

As shown, one-half of the Ferencz examples have CD index values that are 40% to 60% below the claimed lower limit of 1.3 newtons/50 mm per gram of nonwoven. Clearly, Ferencz does not inherently have the claimed properties and Ferencz is not a like material since there is no teaching or provision of the increased number of filaments in the cross direction.

The lack of inherency and the deficiencies of the Ferencz teachings are particularly shown by the inconsistent strip tensile and tensile index properties of Examples 106, 302 and 403B. More particularly, it should be appreciated that Example 106 has a strip tensile value of 4 and a CD index value of 2.06 However, Examples 302 and 403B respectively have strip tensile values of 4.4 and 4.5, but index values of only 0.77 and 0.78. The Ferencz processing does not account for variations in the nonwoven basis weight, and there is no specific teaching that clarifies the deficiency. There is no inherent achievement of the claimed CD index value of "at least 1.3 newtons/50mm/gram of nonwoven" and, in fact, the variations in the patent examples prevent Ferencz from even suggesting the claimed nonwovens and invention.

Ferencz contains no teachings to suggest the claimed nonwovens or to guide one skilled in the art to processes

resulting in the claimed nonwovens. That is, Ferencz never teaches the desirability of the combination of physical properties set forth in the claims. Further, Ferencz does not disclose the specific method used in the preparation of any of the reported examples. The Ferencz reference therefore fails to recognize the targeted physical properties of the claimed invention and never associates specific processing with affected physical properties. In view of these Ferencz deficiencies, the reference fails to support a prima facie rejection of the claimed invention.

Applicants have discovered that the desired combination of physical properties is achieved through the enhanced concentration of filaments in the CD direction. Ferencz does not teach or suggest concentration of filaments in the CD direction. In the absence of such teachings, there is no expectation that Ferencz would achieve the claimed nonwovens having the recited combination of physical properties.

The grab properties in Ferencz are not suggestive of the strip tensile properties set forth in the claims. As the Examiner is aware, the grab test is different from the strip test, and the tests evaluate different properties. Enclosed Exhibit A is a copy of ASTM D-1682-64 which describes the grab test in Definition 3.1 and the strip

test in Definition 3.2. As noted above, Ferencz references U.S. Pat. 3,485,706 to Evans, which in turn references the ASTM standards.

In addition to the foregoing reasons, the claim 11 sets forth the increased number of filaments in the CD via the use of angular orientation of one of more the dies used to construct the nonwoven. This structural limitation is not met or suggested by any disclosure contained in Ferencz. Further, this structural limitation may not be presumed to be inherently present in Ferencz. Contrarily, the above conversion data show the lack of the claimed CD index properties in Ferencz and precludes the assumption of the same. The CD filament concentration of the claimed nonwovens is believed to be associated with the CD index properties and the improved isotropy.

For all of the foregoing reasons, claims 10 and 11 are patentably distinguished over Ferencz.

The further rejection of claims 12 and 13 under 35 USC 103(a) as unpatentable over Ferencz should be withdrawn for the same reasons set forth above. These matters are briefly discussed below.

Claim 12 contains the same physical property limitations set forth in claim 10, except for the more restrictive recitation that the machine direction to cross

direction strength ratio is less than 1.1. Claim 13 is substantially the same as claim 11. Accordingly, claim 13 also sets forth the structural limitation that the claimed nonwoven has a higher number of filaments in the CD direction as compared with identically processed nonwovens of the prior art not having the die disposed at an angular orientation.

The structural recitation of an increased number of filaments in the CD direction via angular die orientation in claims 11 and 13 is not taught or suggested in Ferencz. The structural recitation patentably distinguishes claims 11 and 13 over Ferencz independent of the nonwoven property recitations. Accordingly, these claims are patentable based upon a structural distinction not disclosed in the prior art and allowance of the claims is respectfully requested.

All of the claims presently of record are distinguished by the improved properties demonstrated in connection with the Examples 1-11 of the present application. More particularly, each of these examples was prepared with a higher filament concentration in the CD direction based on the angular orientation of the dies as shown in the apparatus of Fig. 2 of the present application.

Accordingly, beginning with the same base nonwoven, the further processing was modified to demonstrate the importance of hydroentanglement variations resulting from the use of drum covers having larger and smaller size openings, as well as variations in water impingement pressure. In this manner, one skilled in the art is taught the processing techniques used to enhance and modify the physical properties of the nonwovens.

As reported in the table bridging pages 11 and 12 of the application, the thickness of the resulting nonwovens was increased from 50% to 100%, while maintaining the MD and CD tensile strength. This is specifically shown by the column headed loss of strength, MD + CD (percent). Accordingly, the present invention enables an increasing nonwoven thickness with a decreasing density without significant sacrifice of MD and CD tensile properties. In all cases, the MD to CD ratio is maintained below 1.3. Accordingly, increased thickness and reduced density are provided to enhance absorbency without sacrifice of tensile properties and the isotropic relationship thereof.

Example 11 particularly demonstrates the advantages of the nonwovens of the present invention. As reported, a 140 g/m^2 nonwoven prepared in accordance with the invention had matched MD and CD tensile properties of 300 N/50mm and a

density of 0.074 g/cm^3. In a filtration test, the single layer nonwoven of the invention had a 77% efficiency and a head loss of 420 x 10^{-5} bar. This was compared with a nonwoven of the type conventionally used in filtration having a weight of 170 g/m^2 and comprising a meltblown, spunbonded, four layer construction of polypropylene fiber and calendared propylene fiber. The commercial nonwoven displayed a 74% efficiency and a head loss of 540 x 10^{-5} bar. Thus, the nonwoven according to the invention had a better efficiency and a lower head loss, while still having a lower weight per unit area.

Lastly, the Examiner's Response to Arguments erroneously states that Ferencz teaches the same methods of manufacture as applicants. This is not correct since Ferencz never teaches an angular die orientation and the resulting increased number of filaments in the CD direction extending across the width of the nonwoven. This structural deficiency is particularly reflected by the poor CD tensile index properties of half of the Ferencz nowoven examples. Accordingly, the recitation of this structural feature in claims 11 and 13 is not met by Ferencz.

For all of the foregoing reasons, claims 10 - 13 presently of record are in condition for final allowance and such action is requested.

If there are any fees required by this Response, such fees should be charged to Deposit Account No. 16-0820.

Respectfully submitted,

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